

WHAT IS CLAIMED IS:

506 1 > 1. A method for producing a polymer-particle composite comprising a step of forming a polymer-containing layer mainly forming of a polymeric material and a step of bringing a particle suspension containing the particle dispersed in a solvent capable of swelling the polymeric material into contact with the polymer-containing layer.

2. A method for producing a polymer-particle composite according to Claim 1 wherein the polymer-containing layer is formed on a substrate and is brought, as is still on the substrate, into contact with the particle suspension.

3. A method for producing a polymer-particle composite according to Claim 2 wherein the polymer-containing layer is formed as a pattern on a substrate.

4. A method for producing a polymer-particle composite according to Claim 2 wherein the substrate is selected from a group consisting of a metal, a semiconductor, an inorganic material, a film and an unwoven fabric.

5. A method for producing a polymer-particle composite according to Claim 1 wherein the step of bringing the particle suspension into contact with the polymer-containing layer is a step of immersing the polymer-containing layer in the particle suspension or a step of applying the particle suspension onto the polymer-

containing layer.

6. A method for producing a polymer-particle composite according to Claim 1 wherein the polymeric material is polyelectrolytes.

7. A method for producing a polymer-particle composite according to Claim 6 wherein the polyelectrolyte is a polyelectrolyte having a charge opposite to the charge possessed by the particle.

8. A method for producing a polymer-particle composite according to Claim 6 wherein the polyelectrolyte is a water-soluble polyelectrolyte.

9. A method for producing a polymer-particle composite according to Claim 1 wherein a mean particle size of the particle is 1 nm to 100  $\mu$ m.

10. A method for producing a polymer-particle composite according to Claim 9 wherein the particle is one selected from a group consisting of an oxide, a metal, a semiconductor and a substance containing carbon as a structural element, or a mixture thereof.

11. A method for producing a polymer-particle composite according to Claim 1 wherein the concentration of the particle in the particle suspension is 1 % by volume to 65 % by weight.

12. A method for producing a polymer-particle composite according to Claim 1 wherein the solvent capable

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of swelling the polymeric material is a solvent having a dielectric constant of 2 or more or a mixture thereof.

13. A method for producing a polymer-particle composite according to Claim 12 wherein the solvent capable of swelling the polymeric material is a solvent containing water.

14. A polymer-particle composite produced by a method for producing a polymer-particle composite according to Claim 1.

15. A polymer-particle composite comprising a particle packed uniformly in a polymeric material and having a self-standing ability, wherein a mean particle size of the particle is 1  $\mu$ m or less.

16. A polymer-particle composite according to Claim 15 wherein the polymeric material is polyelectrolytes having a charge opposite to the charge possessed by the particle.

17. A polymer-particle composite according to Claim 15 wherein the particle is present in an amount of 1 % by volume or more.

18. A polymer-particle composite according to Claim 15 wherein the particle content varies continuously over the range from one side to the other.

19. A colloidal crystal comprising a polymer-particle composite according to Claim 14.

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20. A sintered particle produced by sintering a polymer-particle composite according to Claim 14.

21. A method for producing a porous material comprising a step of forming a polymer-particle composite by a method for producing a polymer-particle composite according to Claim 1 using a particle capable of being decomposed by means of a heat treatment or a chemical treatment or being extracted out, a step of filling a certain material into a pore between the particles in the polymer-particle composite and a step wherein the particles in the polymer-particle composite are decomposed by means of a heat treatment or a chemical treatment or being extracted out whereby removing the particle.

22. A method for producing a porous material according to Claim 21 wherein the step of filling a certain material into a pore between the particles in the polymer-particle composite is a step of filling a metal into a pore between the particles by means of an electrolytic plating or an electroless plating.

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